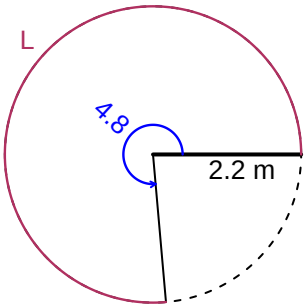
Name: Date:

Trig Final (Solution v30)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 2.2 meters. The angle measure is 4.8 radians. How long is the arc in meters?

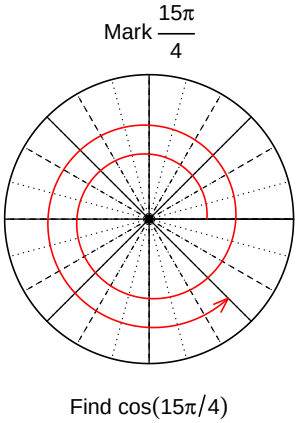


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

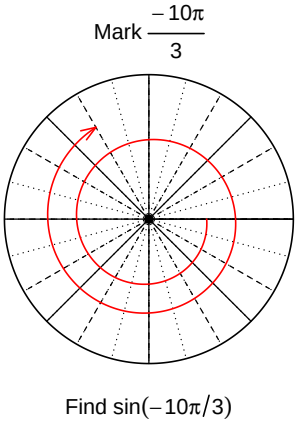
$L = 10.56$ meters.

Question 2

Consider angles $\frac{15\pi}{4}$ and $\frac{-10\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{15\pi}{4}\right)$ and $\sin\left(\frac{-10\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\cos(15\pi/4)$



Find $\sin(-10\pi/3)$

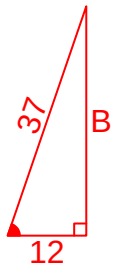
$\cos(15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(-10\pi/3) = \frac{\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{12}{37}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

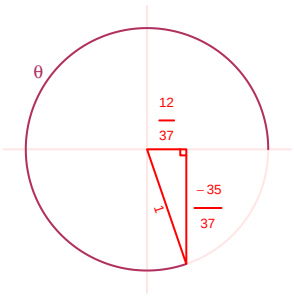
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$12^2 + B^2 = 37^2$$
$$B = \sqrt{37^2 - 12^2}$$
$$B = 35$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-35}{37}}{\frac{12}{37}} = \frac{-35}{12}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -8.22$ meters, a frequency of 3.93 Hz, and an amplitude of 2.03 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.03\cos(2\pi 3.93t) - 8.22$$

or

$$y = 2.03\cos(7.86\pi t) - 8.22$$

or

$$y = 2.03\cos(24.69t) - 8.22$$